



# 15 MHz Rail-to-Rail Operational Amplifier

## Preliminary

## AD8519

### FEATURES

SOT23 package saves space

Wide Bandwidth : 15 MHz @ 5V

Low Offset Voltage : 1.2 mV max

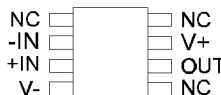
Rail-to-Rail Output Swing

4 V/ $\mu$ s slew rate

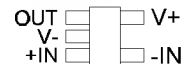
Unity-Gain Stable

Single-Supply Operation: +3 to +12V

8-Lead SO  
(R Suffix)



5-Lead SOT23  
(RT Suffix)



### APPLICATIONS

Portable Communications

Microphone Amplifiers

Portable Phones

Sensor Interface

Active Filters

PCMCIA cards

ASIC input drivers

Wearable Computers

Battery Powered Devices

Voltage reference buffers

Personal Digital Assistants

### GENERAL DESCRIPTION

The AD8519 is a single rail-to-rail output bipolar amplifier in a SOT23-5 package with a unity gain bandwidth of 15 MHz and a typical voltage offset of less than 1 mV. This part brings precision and bandwidth to the SOT-23 package. The low supply current makes the AD8519 ideal for battery power applications. The rail-to-rail output swing of the AD8519 is larger than standard video op amps, making them useful in applications which require greater dynamic range than standard video amplifiers provide. The 4 V/ $\mu$ s slew rate makes the AD8519 a good match for driving ASIC inputs, such as voice codecs.

The small SOT23 package make it possible to place the AD8519 next to sensors, reducing external noise pickup.

The AD8519 is specified over the extended industrial ( $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ ) temperature range. The AD8519 is available in 5 lead SOT23-5 and SO-8 surface mount packages.

### REV. 0

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# ELECTRICAL CHARACTERISTICS (@ $V_S=+5.0V$ , $V_{CM} = 0V$ , $T_A=+25^\circ C$ unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
INPUT CHARACTERISTICS						
Offset Voltage	V <sub>OS</sub>	AD8519ARU (SOT23-5)		600	1100	μV
		-40° ≤T <sub>A</sub> ≤ +125°C		800	1300	μV
		AD8519AR (SO-8)		600	1000	μV
		-40° ≤T <sub>A</sub> ≤ +125°C			1100	μV
Input Bias Current	I <sub>B</sub>	-40° ≤T <sub>A</sub> ≤ +125°C			800	nA
Input Offset Current	I <sub>OS</sub>	-40° ≤T <sub>A</sub> ≤ +125°C			900	nA
Input Voltage Range	V <sub>CM</sub>		0		±50	nA
Common-Mode Rejection	CMRR	0V≤V <sub>CM</sub> ≤+4.0V, -40 ≤T <sub>A</sub> ≤ +125°C	63	100	±100	nA
Large Signal Voltage Gain	A <sub>VO</sub>	R <sub>L</sub> = 2kΩ		30	+4	V
		R <sub>L</sub> = 10kΩ	50	75		V/mV
		R <sub>L</sub> = 10kΩ , -40° ≤T <sub>A</sub> ≤ +125°C	30			V/mV
Offset Voltage Drift	ΔV <sub>OS</sub> /ΔT	Note 1		2		μV/°C
Bias Current Drift	ΔI <sub>B</sub> /ΔT			500		pA/°C
OUTPUT CHARACTERISTICS						
Output Voltage Swing High	V <sub>OH</sub>	I <sub>L</sub> = 250 μA -40° ≤ T <sub>A</sub> ≤+125°C	4.90			V
Output Voltage Swing Low	V <sub>OL</sub>	I <sub>L</sub> = 5 mA	4.80			V
		I <sub>L</sub> = 250 μA -40° ≤ T <sub>A</sub> ≤+125°C			80	mV
		I <sub>L</sub> = 5 mA			200	mV
Short Circuit Current	I <sub>SC</sub>	Short to Ground		±70		mA
Maximum Output Current	I <sub>OUT</sub>			±25		mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	V <sub>S</sub> = +2.5V to +7V, -40° ≤T <sub>A</sub> ≤ +125°C	80	110		dB
Supply Current/Amplifier	I <sub>SY</sub>	V <sub>OUT</sub> = 2.5V 40° ≤T <sub>A</sub> ≤ +125°C		600	800	μA
					900	μA
DYNAMIC PERFORMANCE						
Slew Rate	SR	1V <V <sub>OUT</sub> <4V, R <sub>L</sub> =10 kΩ		4		V/μs
Settling Time	t <sub>s</sub>	To 0.01%		1200		ns
Gain Bandwidth Product	GBP			15		MHz
Phase Margin	ø <sub>m</sub>			60		degrees
NOISE PERFORMANCE						
Voltage Noise	e <sub>n</sub> p-p	0.1 to 10 Hz		0.5		μV <sub>p-p</sub>
Voltage Noise Density	e <sub>n</sub>	f=1kHz		7		nV/√Hz
Current Noise Density	i <sub>n</sub>	f=1 kHz		0.4		pA/√Hz

# ELECTRICAL CHARACTERISTICS (@ $V_S=+3.0V$ , $V_{CM} = 0V$ , $T_A=+25^{\circ}C$ unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
INPUT CHARACTERISTICS						
Offset Voltage	V <sub>OS</sub>	AD8519ARU (SOT23-5) -40° ≤T <sub>A</sub> ≤ +125°C		700 900	1200 1400	μV μV
		AD8519AR (SO-8) -40° ≤T <sub>A</sub> ≤ +125°C		700	1100 1200	μV μV
Input Bias Current	I <sub>B</sub>				800	nA
Input Offset Current	I <sub>OS</sub>				±50	nA
Input Voltage Range			0		+2	V
Common-Mode Rejection	CMRR	0V≤V <sub>CM</sub> ≤+2.0V, -40°C ≤T <sub>A</sub> ≤ +125°C	55	75		dB
Large Signal Voltage Gain	A <sub>VO</sub>	R <sub>L</sub> = 2kΩ		20		V/mV
		R <sub>L</sub> = 10kΩ	20	30		V/mV
OUTPUT CHARACTERISTICS						
Output Voltage Swing High	V <sub>OH</sub>	I <sub>L</sub> = 250 μA I <sub>L</sub> = 5 mA	2.90 2.80			V V
Output Voltage Swing Low	V <sub>OL</sub>	I <sub>L</sub> = 250 μA I <sub>L</sub> = 5 mA			100 200	mV mV
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	V <sub>S</sub> = +2.5V to +7V, -40° ≤T <sub>A</sub> ≤ +125°C	55	80		dB
Supply Current/Amplifier	I <sub>SY</sub>	V <sub>OUT</sub> = 1.5V -40°≤T <sub>A</sub> ≤ +125°C		600	800 900	μA μA
DYNAMIC PERFORMANCE						
Slew Rate	SR	R <sub>L</sub> = 10 kΩ		1.5		V/μs
Settling Time	t <sub>s</sub>	To 0.01%		2000		ns
Gain Bandwidth Product	GBP			7		MHz
Phase Margin	ø <sub>m</sub>			55		degrees
NOISE PERFORMANCE						
Voltage Noise	e <sub>n</sub> p-p	0.1 to 10 Hz		TBD		μV <sub>p-p</sub>
Voltage Noise Density	e <sub>n</sub>	f = 1kHz		10		nV/√Hz
Current Noise Density	i <sub>n</sub>	f=1 kHz		0.4		pA/√Hz

# ELECTRICAL CHARACTERISTICS (@ $V_S = \pm 5.0V$ , $T_A = +25^\circ C$ unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
INPUT CHARACTERISTICS						
Offset Voltage	V <sub>OS</sub>	AD8519ARU (SOT23-5)		600	1100	μV
		-40° ≤ T <sub>A</sub> ≤ +125°C		800	1300	μV
		AD8519AR (SO-8)		600	1000	μV
		-40° ≤ T <sub>A</sub> ≤ +125°C			1100	μV
Input Bias Current	I <sub>B</sub>	V <sub>CM</sub> = 0V			800	nA
		V <sub>CM</sub> = 0V, -40° ≤ T <sub>A</sub> ≤ +125°C			900	nA
Input Offset Current	I <sub>OS</sub>	V <sub>CM</sub> = 0V			±50	nA
		V <sub>CM</sub> = 0V, -40° ≤ T <sub>A</sub> ≤ +125°C			±100	nA
Input Voltage Range			-5		+4	V
Common-Mode Rejection	CMRR	-4.9V ≤ V <sub>CM</sub> ≤ +4.0V, -40° ≤ T <sub>A</sub> ≤ +125°C	70	100		dB
Large Signal Voltage Gain	A <sub>VO</sub>	R <sub>L</sub> = 2kΩ		30		V/mV
Large Signal Voltage Gain	A <sub>VO</sub>	R <sub>L</sub> = 10kΩ	50	70		V/mV
		-40° ≤ T <sub>A</sub> ≤ +125°C	25			V/mV
Offset Voltage Drift	ΔV <sub>OS</sub> /ΔT			2		μV/°C
Bias Current Drift	ΔI <sub>B</sub> /ΔT			500		pA/°C
OUTPUT CHARACTERISTICS						
Output Voltage Swing High	V <sub>OH</sub>	I <sub>L</sub> = 250 μA -40° ≤ T <sub>A</sub> ≤ +125°C	+4.90 +4.80			V V
Output Voltage Swing Low	V <sub>OL</sub>	I <sub>L</sub> = 250 μA -40° ≤ T <sub>A</sub> ≤ +125°C			-4.90 -4.80	V V
Short Circuit Current	I <sub>SC</sub>	Short to Ground		±70		mA
Maximum Output Current	I <sub>OUT</sub>			±25		mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	V <sub>S</sub> = ±1.5V to ±6V, -40 ≤ T <sub>A</sub> ≤ +125°C	60	100		dB
Supply Current/Amplifier	I <sub>SY</sub>	V <sub>OUT</sub> = 0V 40° ≤ T <sub>A</sub> ≤ +125°C		600	800 950	μA μA
Supply Voltage Range	V <sub>S</sub>		+3.0(±1.5)		+12(±6)	V
DYNAMIC PERFORMANCE						
Slew Rate	SR	-4V < V <sub>OUT</sub> < 4V, R <sub>L</sub> = 10 kΩ		7		V/μs
Settling Time	t <sub>s</sub>	To 0.01%		1000		ns
Gain Bandwidth Product	GBP			15		MHz
Phase Margin	ø <sub>m</sub>			60		degrees
NOISE PERFORMANCE						
Voltage Noise	e <sub>n</sub> p-p	0.1 to 10 Hz		TBD		μV <sub>p-p</sub>
Voltage Noise Density	e <sub>n</sub>	f=1 kHz		7		nV/√Hz
Current Noise Density	i <sub>n</sub>	f=1 kHz		0.4		pA/√Hz

## ABSOLUTE MAXIMUM RATINGS

Supply Voltage.....	±6 V
Input Voltage <sup>1</sup> .....	±6 V
Differential Input Voltage <sup>2</sup> .....	±0.6 V
Internal Power Dissipation	
SOT23 (RT).....	Observe Derating Curves
SOIC (S) .....	Observe Derating Curves
Output Short Circuit Duration .....	Observe Derating Curves
Storage Temperature Range	
RT, S, Packages .....	-65°C to +150°C
Operating Temperature Range	
AD8519 .....	-40°C to +125°C
Junction Temperature Range	
RT, S, Packages .....	-65°C to +150°C
Lead Temperature Range (Soldering, 10 seconds).....	+300°C

Package Type	$\theta_{JA}$ <sup>3</sup>	$\theta_{JC}$	Units
5-Lead SOT-23 (RT)	230		°C/W
8-Pin SOIC (S)	158	43	°C/W

## NOTES

<sup>1</sup> For supply voltages less than 6 volts, the input voltage is limited to less than or equal to the supply voltage.

<sup>2</sup> For differential input voltages greater than 0.6 volts the input current should be limited to less than 5 mA to prevent degradation or destruction of the input devices.

<sup>3</sup>  $\theta_{JA}$  is specified for the worst case conditions, i.e.,  $\theta_{JA}$  is specified for device soldered in circuit board for SOIC and SOT23 packages.

## MAXIMUM POWER DISSIPATION

The maximum power that can be safely dissipated by the AD8519 is limited by the associated rise in junction temperature. The maximum safe junction temperature is 150°C for these plastic packages. If this maximum is exceeded momentarily, proper circuit operation will be restored as soon as the die temperature is reduced. Leaving the product in the “overheated” condition for an extended period can result in permanent damage to the device. To ensure proper operation, it is important to observe the recommended derating curves shown in Figures x and y.

## ORDERING GUIDE

ART is available in 2,500 piece reels only.

AR is available in 2,500 piece reels only.

Model	Temperature Range	Package Description	Package Option
AD8519ART	-40°C to +125°C	5-Lead SOT23	RT-5
AD8519ART	-40°C to +125°C	5-Lead SOT23	SO-8
AD8519AR	-40°C to +125°C	8-Pin SOIC	SO-8
AD8519AR	-40°C to +125°C	8-Pin SOIC	SO-8